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# Influence of Halopriming on Different Physiological Attributes of Soyabean Seed under Salinity Stress Condition

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**A B S T R A C T**

Halopriming is soaking of seeds in salt solutions which enhanced germination and seedling emergence uniformity under adverse environmental conditions. Common using salts are NaCl, KCl, $KNO_3$ and $CaCl_2$. The objective of this study to evaluate the effect of seed priming with NaCl (10Mm & 20Mm) and KCl (10Mm & 20Mm) of different concentrations on different physiological attributes like germination percentage, Speed of germination, Germination value of Soybean seed under different salt concentration. Moist towel paper and soil (pot) used as substratum to conduct all the experimental trials. In this experiment it is revealed that, in both the experiments, Seeds primed with KCl (20Mm) recorded highest germination percentage, speed of germination and germination value when compared with untreated control seeds. The aim of the study was to mitigate all ill effects of salinity and improve the performance of seedling under salt stress condition.

## Introduction

The botanical name of soybean is Glycine *max*. The soybean is the species of legume native to East Asia, widely grown for its edible bean which has numerous uses. Agricultural crops are facing various types of biotic and abiotic stresses. Among the abiotic stresses, soil salinity adversely influences the crop production (Hameed *et al.,* 2008; Bakht *et al.,* 2007, 2011). Salts may influence plant growth by causing direct injury to the growing cells or indirectly by reducing the amount of water reaching the growing region and photosynthates (Mass and Nieman, 1978).

Salt stress induces water stress by decreasing the osmotic potential of the soil solutes and thus making it very difficult for roots to extract the required water from its surrounding media. The effects of higher salt stress on plants can be observed in terms of decreased productivity or plant death (Parida and Das, 2004).

Plant response to salt stress is very complex and depends upon the duration of salinity, developmental stage of plant at salt exposure, type of salt and many other factors (Cramer *et al.*, 2001). At higher salinity levels, the crop yield is decreased so drastically that cultivation of crop becomes uneconomical without amendments of soil.

Pre-sowing seeds treatment with inorganic salts (halopriming) is very easy, low risk and low-cost technique to alleviate the salinity problems of agricultural lands. The halopriming technique is very effective for improving germination and crop establishment under salt stressed conditions. Generally; seed priming increases the uniformity and rate of seed emergence of crops (Sivritepe *et al.*, 2003; Bakht *et al.*, 2010, 2011). This present study was initiated to investigate the effect and role of halopriming on germination and emergence traits on soybean under salinity stress condition.

## Materials and Methods

Experiments are carried out at Department of Seed Science & Technology, HNB Garhwal Central University, Srinagar during 2015. Soybean seeds were surface sterilized with 1% solution of sodium hypochlorite for 5-10min and then washed with distilled water. Seeds were primed with NaCl (10Mm and 20Mm concentration) and KCl (10Mm and 20Mm concentration) for 3 hours and then dried properly.

## Media

Moist towel paper and soil used as substratum to conduct all the experimental trials.

## Media-1(towel paper test)

Twenty seeds were placed on moist towel paper in three replications. The towel paper was kept in seed germinator at cylindrical position at 25$^{o}$C (seeds were considered to be germinated with emergence of the radical). Germination response was studied on different levels of NaCl salinity i.e. 40Mm and 80Mm, replicating each concentration three times and daily observations were taken up to the completion of experiment (ISTA, 1985).

## Media-2(soil)

Soil sieved (< 2 mm) properly and then measures the conductivity of soil with the help of conductivity meter. Conductivity of normal soil was observed 1.191ms at room temp. Soil and FYM were mixed in a ratio of 3:1, and then 1 kg soil was filled in each pot. In this experiment, seeds were halo primed with NaCl (10Mm & 20Mm) and KCl (10Mm & 20Mm). In each treatment, seeds were soaked in respective solutions for 3 hours. Soil was also, treated with 40mM and 80mM concentration of NaCl solution (500ml/kg).

Twenty treated seeds of soybean were sown in each pot. All the treatments were replicated three times with twenty seeds per replication. After one-month seedlings were uprooting and evaluated for various seedling parameters like Germination percentage, speed of germination, germination value was studied.

## Treatment details

Properly sieved soil was divided in three lots and each lot separately used to conduct the experiments with differently treated seed

Experiment-1- Lot no-1(soil) was treated with 40Mm of NaCl (500ml/kg)

Experiment-2- Lot no-2 (soil) was treated with 80Mm of NaCl (500ml/kg) Experiment-3- Lot no301 (soil) was without any treatment.

After soil treatment, seeds were treated by the following ways:

T1- seeds treated with 10Mm NaCl solution
T2- seeds treated with 20Mm NaCl solution
T3- seeds treated with 10Mm KCl solution
T4- seeds treated with 20Mm KCl solution
T5-control

The data obtain from each of the experiments were subjected to an analysis of variance. When even necessary the per cent values were transformed to arc-sine values before analysis. The Critical difference (CD) were calculated at 5 and 1 per cent probability level (Gomez and Gomez, 1984).

## Results and Discussion

Germination percentage, Speed of germination ,Germination value are important index for salt tolerance and significant differences were observed due to priming treatment under different salinity stress imposed using sodium chloride at 40 & 80 Mm on above parameters , a greater reduction in unprimed seeds was noticed at a salinity level of 80Mm.

Lower level of salinity delay germination percentage whereas higher level not only reduce the germination percentage but also can inhibit the proper emergence of seedlings (Ghoulam and Fares, 2001).

Treatment with KCl (20Mm) significantly increase the germination percentage, Speed of germination and germination value as compared to unprimed seeds. Salinity stress has negative effects on growth parameters and application of halopriming could alleviate the harmful effect of salinity in soybean seeds. For towel paper experiment, the highest germination percentage (97.67%), speed of germination (2.74) and germination value (137.24) was observed in treated towel paper (40Mm NaCl) in which seeds were treated with KCl(20Mm).

These parameters were non-significantly higher than control. While for Pot experiment, the highest germination percentage (87%), speed of germination (2.42) and germination value (123.84) was observed in untreated soil in which seeds were treated with KCl(20Mm). These parameters were significantly higher than control (Fig. 1 and 2).

### Pot experiment

### Germination percentage

In experiment-1(40Mm NaCl treated towel paper), primed seeds showed an increase of 7.03% and 2.22% germination percentage (given treatment KCl(20Mm) and NaCl(10Mm), respectively and remaining treatments showed a reduction of (-10.74% and -8.9) over control, whereas in experiment-2 (80Mm NaCl treated towel paper), primed seeds showed a increase of 3.69% (given treatment KCl (20Mm), while remaining treatments showed a reduction of (-9.2% and -5.98% and -1.38), shown in (graph-2) germination percentage over control.

Whereas in experiment-3 (untreated), primed seeds showed a increase of 2.81% and 1.4% (given treatment KCl (20Mm) and NaCl (10Mm) respectively and reduction of (-11.92% and -11.57%) germination percentage over control. So, comparison among following experiments, we found that in 80mM NaCl treated towel paper sowed more salinity stress, but treatment with KCl (20Mm) overcome this adverse effect.

### Speed of germination

In experiment-1 (40mM NaCl treated towel paper), primed seeds showed an increase of

6.22% and 1.55% (given treatment KCl (20Mm) and NaCl (10Mm), respectively and remaining treatments showed a reduction of (-11.28% and -10.11%) speed of germination over control, whereas in experiment-2 (80Mm NaCl treated towel paper), primed seeds showed a increase of 0.46% (given treatment KCl (20Mm) and remaining treatments showed a reduction of (-13.14%, -10.79% and -0.93%) shown in (graph-1) speed of germination over control, whereas in experiment-3 (untreated), primed seeds showed a increase of 1.1% and 0.36% (given treatment KCl (20Mm) and NaCl (10Mm) respectively, while reduction of (-15.12% and -11.07%) speed of germination over control. So, comparison among following experiments, we found that in 80mM NaCl treated towel paper showed more salinity stress.

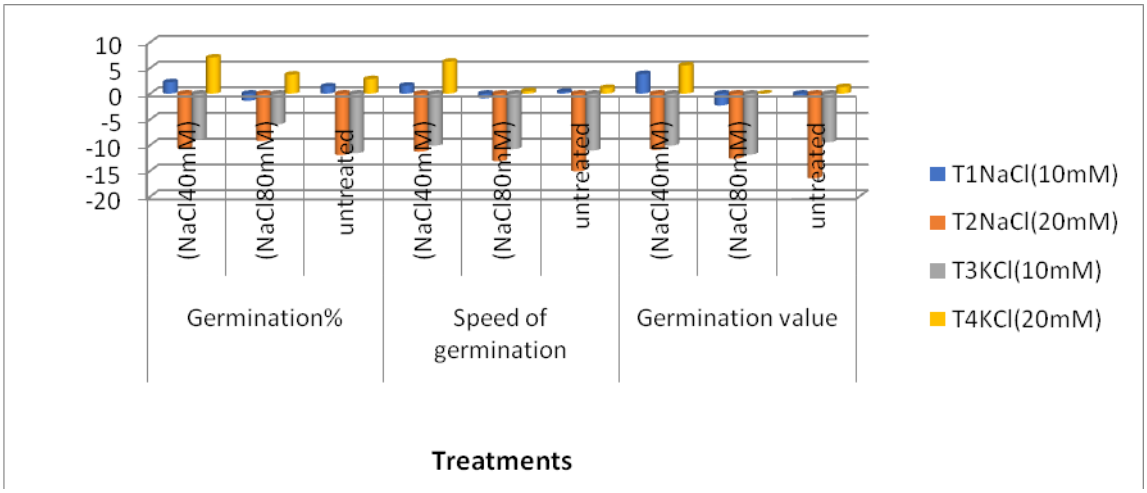


**Figure.1** Comparative performance of seed priming using NaCl and KCl under different NaCl concentrations with respect to planting value parameters (Towel paper)

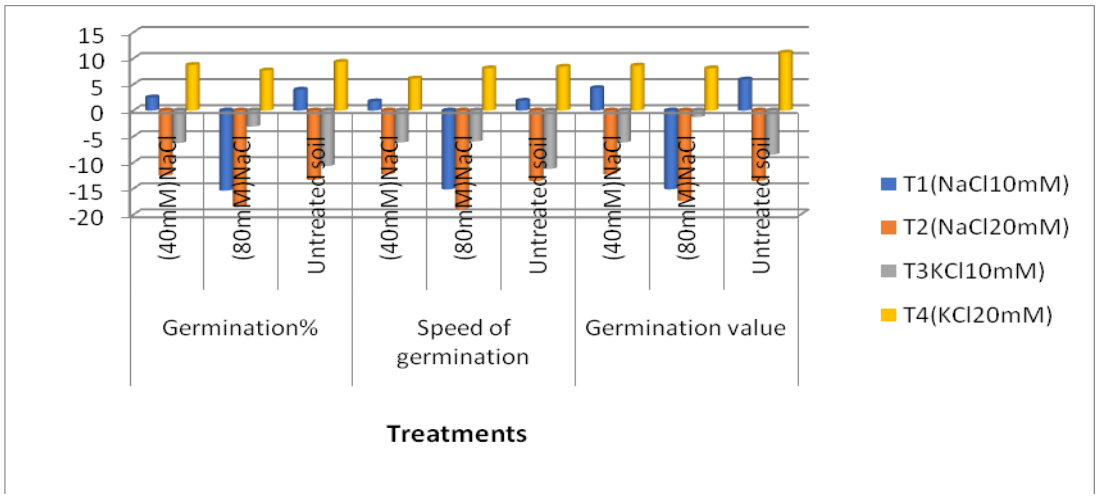


**Figure.2** Comparative performance of seed priming using NaCl and KCl under different NaCl concentrations with respect to planting value parameters (POT)

## Germination value

In experiment-1(40mM NaCl towel paper), primed seeds showed an increase of 5.48% and 3.81(given treatment KCl (20Mm) and NaCl (10Mm), respectively and remaining treatments showed a reduction of (-10.91% and -10.11%) germination value over control,

whereas in experiment-2 (80Mm NaCl treated towel paper), primed seeds showed a increase of 0.009% (given treatment KCl (20Mm) and remaining treatments showed a reduction of (-12.65%, -11.86% and -2.3%) shown in (graph-1) germination value over control, whereas in experiment-3 (untreated), primed seeds showed an increase of 1.28 (given treatment KCl (20Mm), while reduction of (-16.45%, -9.45% and -0.69) germination value over control. So, comparison among following experiments, we found that in 80mM NaCl treated towel paper showed more salinity stress.

Various studies on plant responses to stress conditions have some contradictory or inconclusive results regarding the differential responses in salt tolerance. The present study revealed that seed priming with KCl (20Mm) produced a desirable result, promoting the germination percentage as well as increased seedling growth. It is concluded that the ill effect of salinity stress could mitigated to considerable extend by advocating seed priming with KCl(20Mm). The primed seed performed better than the untreated seeds under salt stress conditions. Hence seed priming with KCl (20mM) could be recommended for mitigating the adverse effect of salt stress in Soybean seeds.

## References

Bakht J, Shafi M, Khan AA, Hussain S, Tariq M, Akbar H, Jan AU, Rehamn MU (2007). Growth performance of Oat and Barley at early seedling stage under saline environment. Sarhad J. Agric. 23: 565-569.

Bakht J, Shafi M, Shah SR (2011). Response of maize cultivars to various priming sources. Pak J. Bot. 43: 205-212.

Bakht J, Yousef J, Shafi M, Sher H (2011**).** Response of maize (*Zeamays*L.) to seed priming with NaCl and salinity stress. Spanish J. Agric. 9: 252-261.

Cramer, G.R. and Nowak, R.S. (1992). Supplemental manganese improves the relative growth, net assimilation and photosynthetic rates of salt stressed barley. Physiologia Plantarum 84: 600-605.

Cramer, G.R., Schmidt, C.L. and Bidart, C. 2001. Analysis of cell wall hardening and cell wall enzymes of salt-stressed maize (*Zea mays*) leaves. Australian Journal of Plant Physiology 28:101-109.

Ghoulam C, Fares K. Effect of salinity on seed germination and early seedling growth of Sugarbeet (*Beta vulgaris* L.). Seed science & technology. 2001; 29; 357-364.

Gomez KA Gomez AA. Statistical procedures for agricultural Research, John Wiley and Sons, New York,1984.

Hameed M, Naz N, Ahmad MSA, Din IU, Riaz A (2008). Morphological adaptations of some grasses from the salt range, Pakistan. Pak. J. Bot. 40: 1571-1578.

Mass EV, Nieman RH (1978). Physiology of plant tolerance to salinity. In Jung G.A. (eds.) Crop tolerance to suboptimal land conditions. ASA CSSA SSSA Madison Wisconsin, p. 277.

Parida AK, Das AB (2004). Salt tolerance and salinity effect on plants: A review. Ecotox. Environ. Safe, 60: 324-349.

Sivritepe N, Sivritepe HO, Eris A (2003). The effects of NaCl priming on salt tolerance in melon seedlings grown under saline conditions. Sci. Hortic. 97: 229-237.

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